Processor Technology
6200 Hollis Street
Emeryville, Ca. 94608

BERKELEY, CALIF.

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REQUESTED INFORMATION

Could you use a Resident Assembler, Editor and Monitor for the 8800?

CC

We have them!

GET TO KNOW THE FULL POWER OF YOUR ALTAIR!

PROCESSOR TECHNOLOGY CORP. provides the hardware AND the software you really need to accomplish things with your Altair 8800.

Want specifics?

- The only CRT terminal display module ever offered that is actually part of the computer
- A reasonably priced, LOW POWER, 4K Memory
- A versatile input/output module designed to meet most common I/O requirements with *one card*
- A reprogrammable read only memory (EPROM) module
- A rugged full length mother board with improved power distribution and integral bus terminator and card cage
- FREE SOFTWARE, or close to it!
- Firmware ROM modules containing our Software programs

FEATURES:

- Full 8800 hardware and software compatibility: JUST PLUG IN!!
- Maximum versatility: each card can be used in the widest range of applications.
- Conservative thermal design for long life and reliable operation.
- Maximum noise immunity: hysteresis bus receivers on noise prone high speed inputs.
- Highest possible quality: No compromise design!
- 100% Guaranteed: six month warranty.

READ ON . . .

Each of our kits contains all necessary parts including double sided epoxy PC board with plated through holes and gold edge contacts, all IC's, voltage regulators, massive heatsink, and mounting hardware. Complete instructions are included for easy assembly and checkout. Every kit and assembled unit also includes information on how to use the module most effectively, covering software programming considerations as well as hardware connections.

THE DETAILS . . .

FAMILY SPECIFICATIONS:

Bus connection: Fully 8800 compatible, electrically and mechanically. Outputs to the 8800 bus are three state, standard TTL levels.
Storage temperature range: –40 to +85° C
Operating environment: 0 to 50° C, humidity to 95%, non condensing.

ALS-8

Ever dream of just turning on your computer and having its full power available instantly? The ALS-8 Firmware Module gives you that kind of "turn on the switch" system with 4K of PROM's pre-programmed with a greatly *expanded* version of our Software Package No. 1.

This powerful file oriented package is the finest Resident Assembly Language Operating System available today. 8080 assembly language programs can be stored as named files (5 letter names) and called at will to be assembled, edited, or listed by line number. Six files can reside in memory at once, or, they can be stored in either source or object code on paper tape, cassette or any other form of storage medium for re-input at a later time. Assembly of the source file can take place from a memory file or from any input device you choose.

The assembler converts the mnemonic codes and labels of the assembly source language program to object code at any address you choose. (The run address can be different from the location where the code is placed.) Symbolic addressing includes the ability to chain common symbols from one program to another even though the other program was assembled long ago. Features of the assembler include labels, comments, expressions, constants, relative symbolic addressing . . . in short a professional system just made for assembly language work.

Input/output for the program is so versatile that it defies the imagination, the driver software can even change the I/O configuration under program control. That's right . . . a program can output one batch of information to one port and a different batch to another port, each seemingly at the same time without human intervention. The system can handle any I/O configuration you can hook up and will call to any driving software you wish to implement for the I/O.

Also, if you are new to computers, the manual included with each module not only explains how to use the program (with examples), but goes on to explain each routine of the System and how to call these routines from other programs you have written. This combined with the I/O handling along with a custom "command table" allows every ALS-8 to be customized within your system to your individual needs. You don't have to worry about being locked into a ROM version, this one is designed with your expansion and creativity in mind.

The ALS-8 Firmware comes complete with a module with all components capable of holding 8K of TURN ON THE SWITCH program. So why 8K? Because we wrote this system to be upward compatible with future software developments and the first of these, an interpretive simulator, is up and running now!

SIM-1 EXPANSION FIRMWARE

INTERPRETIVE SIMULATOR????? Yes, an interpretive simulator that runs 8080 programs, in an interpretive mode, on the same 8080 that contains the Simulator. This isn't just a debug program, because the program thinks it's an 8080! That's right, all registers, flags, program counter, and stack are SIMULATED! Breakpoints are in the simulator program, not a jump to a restart location. (How else would you debug a program that needed the restart location?) Also, when a call or jump instruction is encountered, full control remains with the simulator. This is the only system that will not lose control if a program error is made on this type of instruction.

All registers, flags, program counter, stack and memory contents can be changed at all times and there is even a single step mode that allows full printout of all the registers, flags, etc., after each instruction is executed.

Input instructions within the simulated program can be handled three ways: Real Time, Simulated, and Pre-Set. In the simulated mode the simulator stops and asks "what input for input port X." You input from your regular input port for any of the 255 other input ports! Output instructions are also simulated directly to you from the simulator. The output to your regular output port identifies the data output as well as the port it would have been output to. Again, don't mistake this for a simple program that handles breakpoints, this simulator actually gets each instruction and runs it under simulator control.

The SIM-1 comes pre-programmed and ready to plug into the ALS-8 module. The ALS-8 is an integral part of the simulator and must be available for its operation. (It would have been a 6K program if the customizing power of the ALS-8 hadn't been there.)

As you can see, this without a doubt is the most powerful program development tool that has ever been resident on an 8080 to this day. It's running now at Processor Technology and a sample print-out illustrating its operation is available on request.

Will paper tapes of the ALS-8 software be available? We imagine they will appear but . . . using 8K of RAM to receive a paper tape that takes the better part of a half hour to load each time a power glitch occurs just doesn't make a real system. Using this module, loaded with the ALS-8 "PERMANENT PROGRAM" will save that expensive RAM for data and development programs as well as giving the true convenience of a "turn-on-the-switch" system.

SOFTWARE NO. 1 FIRMWARE

We have had a number of inquiries about providing Software No. 1 as a PROM Module, so we decided to provide one. The Software No. 1 Firmware Module is the ALS-8's little brother. Software No 1, as we call it, contains the basic resident assembler, system monitor, and line oriented text editor. It has these features: 1) Teletype oriented I/O (i.e. only one I/O device permitted). 2) RAM resident files, perfect for small programs, but difficult for files larger than about 1K Byte. 3) Software No. 1 Firmware cannot assemble from files not in RAM. 4) It is not upward compatible with Disc or Cassette Operating Systems or the Simulator.

SPECIFICATIONS: ALS-8, SIM-1, & SW1F

MEMORY TYPE: 4096 word Erasable PROM's
CYCLE TIME: 1.0 micro-second worst-case
ACCESS TIME: same as cycle time
POWER REQUIREMENT: +8 to 10 VDC at 300 Ma maximum, −14 to −17 VDC at 300 Ma maximum.
BUS PINOUT: Plug-in compatible with Altair 8800 bus.
EDGE CONTACTS: 100 pins (dual 50) on .125" centers
DIMENSIONS: 5.3" x 10.0" (13.46 x 25.4 cm)

VDM-1 VIDEO DISPLAY MODULE

Build a smart terminal into your Altair! Your Altair already has the intelligence, we provide the display module. This is not a limited "TV TYPEWRITER" but an ultra-high speed computer terminal built into your computer. The VDM-1 generates sixteen 64 character lines from data stored in the 1K Byte on-card memory. Alphanumeric data is shown in a 7x9 dot matrix with a full 128 upper *and* lower case ASCII character set. The VDM-1 features EIA Video output for any standard video monitor. (A TV set can be easily modified at your local TV repair shop.) Multiple programmable cursors, automatic text scrolling and powerful text editing software are included FREE!

SPECIFICATIONS: VDM-1

CHARACTER SET: 96 character ASCII, plus control characters 7 x 9 matrix with descending lower case.
DISPLAY FORMAT: 16 lines, 64 characters per line.
DISPLAY MEMORY: 1024 8-bit Bytes LOW POWER Static Read/Write memory
DISPLAY POSITION: Continuously adjustable, horizontally and vertically
I/O, DATA: Addressable as a 1K page of memory, Read or Write.
CURSOR: Solid video inversion (blinking optional) appears at all character positions when bit 7 is high.
I/O, CONTROL: Output from CPU is one 8-bit Byte. The lower four bits control Beginning Line Address; the upper four bits control Beginning Display Offset. Input to CPU is a one bit (DI), Parameter Change Ready flag.
BLANKING CHARACTERS: CR (octal 015) blanks test, except cursor, to end of line. VT (octal 013) blanks text, except cursor, to end of screen.
SIGNAL OUTPUT: 1.0 to 2.5 VP-P video composite, negative sync
MONITOR BANDWIDTH: 6.0 MHz (at −3dB) required video BW.
POWER REQUIREMENTS: +7.5 to +10 VDC at 1.0A maximum, 0.8A typical; ± 14 to 17 VDC at 35 MA.

4KRA LOW POWER STATIC MEMORY MODULE

This 4096 word read/write memory module provides faster, less expensive, more reliable and lower power operation than any comparable memory module sold today.

Faster speed in actual operation results because static memories don't need periodic refreshing. Dynamic memories require a refresh period at least 500 times per second. During this period no data can be written or read from the memory and the computer must sit idle in a "wait" condition.

LOW POWER . . . yes and don't be fooled by "undirected" statements about this subject. All RAM's used in the 4KRA require typically 1/3 the power of standard 2102 or 8101 type RAM's and under worst case conditions draws only 30% more than any currently available dynamic memory. In addition each RAM is manufactured to military specification MIL STD-883. This all adds up to low power and reliability, notice . . . we're the ones who publish the maximum worst case power required by our memory.

Plus, our memory draws so little standby current that they can be operated from a battery back up in case of power failure. This allows long term retention of data under loss of power conditions. Our TB-101 illustrates how to add a few simple components to implement this feature and is shipped with every 4KRA sold. In short we've done everything we could to make this the best 4K memory module in the computer field.

SPECIFICATIONS: 4KRA

Maximum capacity: 4096 eight bit words
Operating mode: Static
Access time: 520 nsec. maximum
Cycle time: 520 nsec. maximum, read or write
Bus pinout: Plug-in compatible with Altair 8800 bus
Edge contacts: Gold plated, 100 pins (dual 50) on .125" centers
Power requirements, operating: +7.5 to +10 VDC at 1.0A maximum (0°C), 0.8A typical at 25°C.
standby: + 1.6 to +2.5 VDC at 0.5A maximum, 0.4A typical.
Dimensions: 5.3" x 10.0" (13.46cm x 25.4cm)

2KRO EPROM MEMORY MODULE

Read only memories (ROM's) do not lose their stored data when power is removed and thus have an advantage (we specialize in understatements) when used in stored program applications. Some ROM's, called PROM's, are user programmable, and some PROM's, called EPROM's, are erasable and reprogrammable as well. The most common and least expensive types of EPROM's in use today are the 1702A and MM5203; both are organized as 256 x 8 bit arrays. Our 2KRO module will accept up to eight of these IC's, providing the user with up to 2048 eight bit words of non-volatile storage for monitor, executive, loader, and other programs.

Each 2KRO module is jumper selectable to fit any one of thirty-two 2K segments within the 65K addressing range of the 8800 computer. Additional jumpers are provided to select the appropriate number of "wait" states as determined by the access time of the EPROM's used. The EPROM's are not provided (everything else is) but are readily available for reasonable prices on the industrial and surplus markets. The module will accept either of two types of EPROM: the 1702, 1702A, MM5202 or 9702 made by AMD, Intel, MIL and National, or the MM5203 made by National. However, both 1702 and 5203 types cannot be used at the same time.

Erasing and programming services for the 1702, 1702A or 5204 will be provided by Processor Technology Company. A neatly printed or typewritten listing in octal (base 8) code of your program or data must be submitted along with address information. There will be a charge of $5.00 per EPROM programmed. For additional information and pricing on our EPROM's ask for our programming bulletin.

SPECIFICATIONS: 2KRO

Maximum capacity: 2048 eight bit words
Operating Mode: Static
Access & Cycle Time: Dependent of EPROM used, logic on card will work over an access time range of 30 to 2500 nsec. Number of "wait" states jumper selectable from zero to four.
Voltage Requirements: +8 to +10VDC, −15 to −18VDC
Power Requirements: 10W max., 8W typical at 25°C with 8 1702A's. Replacement transformer available for full negative supply power (see price list).
Bus Pinout: Plug-in compatible with Altair 8800 bus
Edge contacts: 100 pins (dual 50) on .125" centers, gold plated
Dimensions: 5.3" x 10.0" (13.46cm x 25.4cm)

3P+S INPUT/OUTPUT MODULE

Getting data into and out of a computer can be one of the most difficult and expensive tasks in bringing up a working system. Our 3P+S module was designed to provide maximum versatility to allow this one card to meet all the I/O needs of most 8800 system users. For example, one teletype and two TV Typewriters with keyboards can operate simultaneously with the 8800 via one 3P+S module; or, one TV Typewriter, an EIA RS-232 modem, a teletype and another parallel data device can be fully interfaced at the same time.

In addition, one parallel output port is available to be used for setting up control conditions for both parallel and serial ports, as well as to set the serial I/O baud rate under program control. The Baud rate can be set between 35 and 9600 Baud and the module is the only one available that will allow 1.5 stop bits as required by the old model teletypes that are available at such low cost.

Also, one parallel input port is available for polling the Input Data Available flags and External Device Ready flags, as well as for checking the serial I/O error flags. Full handshaking with both input and output peripherals can be implemented with these provisions.

Interfacing to the 8800 vectored interrupt bus is provided on the card as a jumper selectable option, allowing any of the UART (Universal Asynchronous Receiver Transmitter) error flags or handshaking signals to be used to generate interrupts. The Vectored Interrupt Module is required for this purpose.

Addressing of the module is jumper selectable to any one of 64 four address segments within the 8800 range of 256 I/O addresses. Additional flexibility allows either the UART and control port, or the two parallel ports to occupy the lower two relative addresses.

Complete information on each of the options available is included with each 3P+S sold. In addition, a letter to us describing your system configuration will be returned illustrating the best way to implement the system with our module.

SPECIFICATIONS: 3P+S

Outputs: Two 8-bit parallel ports, standard TTL levels, relative addresses at 0 & 1, or 2 & 3.

One Teletype 20mA current loop output.

Four EIA RS-232C outputs for serial transmit data and/or control signals.

One Peripheral Interface Control driver (PIC) 50mA current source for paper tape reader control or cassette recorder control. Jumper selectable to control port output.

Inputs: Two 8-bit parallel ports, standard TTL voltage levels, input current is 0.36mA max.

One Teletype 20mA current loop receiver for UART data input.

Four EIA RS-232C receivers for received serial data and/or control signals.

I/O Control: One 8-bit output port, relative card address selectable as 0 or 2. Lower four bits for baud rate control and/or EIA control outputs and/or PIC driver.

Upper four bits for UART control, i.e. word length, parity, and number of stop bits. Control conditions can be strapped on, off or to software controlled, latched output bits.

One 8-bit input port, relative card address selectable as 0 or 2. Bits selectable with jumpers to read UART error flags, i.e. parity, overrun, and framing errors, and/or EIA control inputs, and/or Data Available flags for parallel input ports, and/or External Device Ready flags for parallel output ports.

Interrupt Control: Any control input, status flag, or UART output may be jumpered to the Interrupt Bus Driver. Interrupt operation requires use of a Vectored Interrupt Module to gate the Restart instruction to the processor.

Bus Pinout: Plug-in compatible with Altair 8800 bus

Edge Contacts: Gold plated, 100 pins (dual 50) on .125" centers.

Voltage Requirements: +8 to +10VDC, +15 to +18VDC, −15 to −18VDC

Power Requirements: 7.0W maximum, 5.5W typical at 25°C

I/O connection: Two standard 44 pin (dual 22) edge connectors, .156" centers

Dimensions: 5.0" x 10.0" (12.7cm x 25.4cm)

MB-1 MOTHER BOARD

Don't worry any more about wiring hundreds of wires in your Altair to expand the mainframe. Our single piece 1/8-inch thick, rugged mother board can be installed as one single replacement for either three or four 88EC Expander cards, so you don't have to replace your already installed 88EC card if you don't want to. The MB-1 has very heavy power and ground busses and comes with a piece of flat ribbon cable for connection to the front panel board of the 8800, a built-in bus terminator, and card guide cage for sixteen plug-in slots.

Specify MB-12 for replacement of three 88-EC's, or MB-1 for replacement of four 88-EC's. Both are the same price. Available now.

Dimensions: .125" x 11" x 14.5" (0.32cm x 27.94cm x 36.83cm)

WWB – WIRE WRAP BOARD

This is the card for all of you who do wire wrap prototyping. Now you can easily create your own custom interfaces or strange "Kluges" of any kind. The WWB has a "universal" pattern of seven rows of pads on .3" centers, so that standard 14, 16, 24, and 40 pin DIP IC sockets can be plugged in. Power and ground are dedicated to pins 16 and 8 respectively (i.e. for 16 pin DIP's) but the layout is designed for fast conversion of each position to other IC sizes. Up to 62 sixteen pin DIP IC's can be used. An extra six wire wraps socket positions have been set aside for connections to the 8800 bus.

Each WWB Kit comes with one 5 volt regulator, a heat sink, and decoupling capacitors. Space is reserved on the card for two more regulators for positive or negative supplies.

Dimensions: 5.3" x 10.0" (13.46 x 25.4 cm)

Contacts: Gold plated, 100 pins (dual 50) on .125" centers

Board Materials: 1/16" G-10 glass-epoxy, plated through holes, 2 oz. copper: solder plated.

EXB – EXTENDER BOARD

This Extender Board makes troubleshooting and servicing of any 8800 compatible module much easier. With the EXB you can plug in a troublesome module five inches above the Mother Board so that both sides of the Board can be reached easily with an oscilloscope, VTVM, or logic probe.

Dimensions: 5.3" x 10.0" (13.46 x 25.4 cm)

Contacts: Gold plated, 100 pins (dual 50) on .125" centers.

Edge Connector: Viking 3VH50/1CV (one included).

Software

Package No. 1: This is the self contained Assembly Language Operating System developed and distributed by Processor Technology for an "almost free" $3.00. The $3.00 package includes the source listing with hexidecimal object code and ample comments throughout. Each command is described and six pages of sample use are included. Paper tapes of this System were sent to Computer Clubs across the nation and are available from them on request. Get the listing and the tape and you will be running one of the finest Assembly Language Systems developed to date.

Package No. 2: We are working on two BASIC Language packages which should be ready by February. One will be a basic BASIC needing about 8K of memory as a minimum and the other will be an Extended version with additional string manipulation, matrix operations and double precision arithmetic capabilities requiring about 12K. Both these packages will be available in Read Only Memory for a reasonable price.

Up & Coming

THE NEWS IN A NUTSHELL!

The last edition of Nutshell produced an overwhelming stream of input to our product development department. This input did not go to thin air as you see.

TTK

The True Time Keeper is alive and well but had to take lower priority than the VDM & CDS. Standby power will be included. Complete facilities for vectored interrupt and the very necessary functions of a real time clock will be included along with the month, day, hour, minutes, seconds... We're sorry it takes so long but this one is well worth waiting for. I WANT ONE, anyone?

MMM-1

Everyone was so firm about the CDS and VDM that the MMM's received hardly a mention. Our business guy insists on seeing the "I WANT ONE'S!" before he cuts us loose. Remember these modules really will play honest music under program control. Two tones on the first module with full program control of amplitude and frequency. Any other ideas?

PPM PROM PROGRAMMING MODULE

Did we really ask if you wanted both or "just" one or the other. We will make one of these as soon as we know the way pricing is going to go on the 5203 and 1702A's.

Warranty

PROCESSOR TECHNOLOGY COMPANY, in recognition of its responsibility to provide quality components and adequate instruction for their proper assembly, warrants its products as follows:

All components sold by Processor Technology Company are purchased through normal factory distribution and any part which fails because of defects in workmanship or material will be replaced at no charge for a period of 6 months following the date of purchase. The defective part must be returned postpaid to Processor Technology Company within the warranty period.

Any malfunctioning module, purchased as a kit and returned to Processor Technology within the warranty period, which in the judgement of P.T.Co. has been assembled with care and not subjected to electrical or mechanical abuse, will be restored to proper operating condition and returned, regardless of cause of malfunction, with a minimal charge to cover postage and handling.

Any modules purchased as a kit and returned to P.T. Co. which in the judgement of P.T. Co. are not covered by the above conditions will be repaired and returned at a cost commensurate with the work required. In no case will this charge exceed $20.00 without prior notification and approval of the owner.

Any modules, purchased as assembled units are guaranteed to meet specifications in effect at the time of manufacture for a period of at least 6 months following purchase. These modules are additionally guaranteed against defects in materials or workmanship for the same 6 month period. All warranted factory assembled units returned to P.T.Co. postpaid will be repaired and returned without charge.

This warranty is made in lieu of all other warranties expressed or implied and is limited in any case to the repair or replacement of the module involved.

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PRICE SCHEDULE effective MARCH 1, 1976

ITEM	DESCRIPTION	KIT PRICE	ASSEMBLED, TESTED
2KRO	Erasable PROM Module	$ 50.00	$ 75.00
3P+S	Three Port Input/Output Module	125.00	175.00
4KRA-4	4096 Word Low Power, Static RAM Memory	139.00	195.00
	RAM **only**, 1024 x 8	25.00	–
SW1F	Software No. 1 Firmware	189.00	245.00
ALS-8	Assembly Language Operating System Firmware Module	250.00	350.00
SIM-1	Simulator Expansion Module	95.00	100.00
VDM	Video Display Module	160.00	225.00
EXB	Extender Board Module	35.00	45.00
WWB	Wire-Wrap Prototyping Module	40.00	–
MB-1/CC	16-slot Mother Board with Bus Terminator and Card Cage (includes BT-1 & CC 16)	70.00	–
CC-16	16-slot Card Cage for MB-1	20.00	–
44PC	Dual 22 pin edge connector (.156"), two required for use with 3P+S	3.00	–
100PC	Dual 50/50 pin edge connector (.125" centers) ONE REQUIRED FOR EACH MODULE TO PLUG INTO 88EC or MB-1	8.50	–
DB25S	Socket, 25 pins for I/O connections on 8800 rear panel	4.50	–
DB25P	Plug and hood, 25 pins for cables plugging into DB25S	4.50	–
TRF-1	High current transformer for PROM module replaces T3 in 8800	5.00	–

DELIVERY: From stock to 3 weeks after receipt of order.
TERMS: All items postpaid to U.S. and Canada if full payment accompanies order. COD orders must include 25% deposit.
DISCOUNTS: Prepaid and COD orders over $375 subtract 5%; orders over $600 subtract 10%.

Prices, specifications, and delivery subject to change without notice.

PROCESSOR TECHNOLOGY CORP., 6200 Hollis Street, Emeryville, Ca. 94608 Phone: (415) 652-8080

ORDER FORM

QUANT.	ITEM	DESCRIPTION	$ EACH	$ TOTAL
			Subtotal	
			Less % discount	
			Taxable total	
			California residents add 6% tax	
			TOTAL	

U.S. Funds Only

ALL ORDERS POSTPAID IF FULL PAYMENT ACCOMPANIES ORDER. C.O.D. ORDERS MUST INCLUDE 25% DEPOSIT.

MASTER CHARGE ACCEPTED. (MINIMUM $25.00) NUMBER AND EXPIRATION DATE:

SIGNATURE ______

NAME ______

ADDRESS ______

CITY ______ STATE ______

ZIP ______

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PLEASE COMMENT ON PRESENT AND FUTURE PRODUCTS ON REVERSE SIDE.